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ABSTRACT

The purpose of this study was to describe and interpret teacher decision-making with ethnically diverse students. A new paradigmatic theoretical framework formed through the confluence of constructivism, multiculturalism, the teacher-as-decision-maker, and semiology guided the research. The research site was a suburban middle school located in the Southeast with a highly diverse student body that included students from 62 different countries. The researcher conducted extensive case studies of a veteran white female life science teacher and a first year white male earth science teacher. The researcher obtained data from the participants through qualitative methods. The research analyzed data analytic induction, the constant comparative method, and semiology. The following insights were obtained: both teachers believed that their students' ethnic backgrounds should not be used as a resource in teaching; their students believed that they benefited from learning science in cooperative groups that included non-mainstreaming students; the majority of the teacher actions involving ethnically diverse students were practices that contained no consideration of pedagogical choice; and the researcher interpreted the school's communication as a Code of Contradiction. The students' diversity in the social sphere was extolled; in the academic sphere, it was excluded. Contains 128 references. (PR)

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Ethnicity, Teacher Decision-Making, Constructivism, And Semiology: A Promising New Mix

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Abstract

The purpose of this study was to describe and interpret teacher decision-making with ethnically diverse students. A new paradigmatic theoretical framework formed through the confluence of constructivism, multiculturalism, the teacher as decision-maker, and semiology guided the research.

The research site was a suburban middle school located in the Southeast with a highly diverse student body that included students from sixty-two different countries and African Americans. The researcher conducted extensive case studies of a veteran White female life science teacher and a first year White male earth science teacher. The researcher obtained data from the participants through qualitative methods. The researcher analyzed data by analytic induction, the constant comparative method, and semiology.

Insights obtained included that both teachers believed that their students' ethnic backgrounds should not be used as a resource in teaching. Their students believed that they benefited from learning science in cooperative learning groups that included non-mainstream students. The majority of the teacher actions involving ethnically diverse students were practices that contained no consideration of pedagogical choices.

The researcher interpreted the school's communication code as a Code of Contradiction. The students' diversity in the social sphere was extolled; in the academic sphere, it was excluded.

Does student ethnicity constitute a fact with instructional consequences? (Peshkin, 1991)

As student populations in the United States of America become increasingly more culturally and ethnically diverse in composition, it is imperative to understand how teachers deal with diverse student populations and make pedagogical decisions (Anderson, 1991). The decisions made by teachers about what is included in the curriculum and how it is taught to students of diverse groups are viewed as crucial in increasing the depth of understanding of the factors which contribute to enhanced student learning outcomes (Barba, 1992; Secada, 1990; Atwater, 1990; Baptiste, 1988; Banks, 1988; Grant and Sleeter, 1986).

Guided by theorists in multiple areas (multicultural education, constructivism, teacher beliefs, teacher decision-making, and semiology) this study sought to provide a response to Alan Peshkin's provocative question. Results suggest that this mix of disparate research domains holds much promise in providing insights relevant to this crucial issue in education.

Purpose

The purpose of this study was to provide a narrative description and interpretation of the decision-making of two science teachers in two separate suburban, multicultural classrooms in the same school. The guiding <u>a priori</u> research question was:

1) How are pedagogical decisions of science teachers influenced by the students' cultural and ethnic

backgrounds?

Two other provocative a priori research questions were:

2) How do the teacher's pedagogical decisions influence students' actions during instruction?

3) How does the cultural and ethnic background of the teacher influence the decisions made by the teacher in a multicultural classroom?

A posteriori research questions emerged during and after the study and were investigated. Among them were:

1) What beliefs do teachers of culturally diverse students hold about their students?

2) What beliefs do students in culturally diverse science classrooms hold about learning science in a multicultural environment?

3) How could teachers' actions involving non-mainstream students for which they consider no choices be understood?

Theoretical Framework

This research study employed a constructivist referent (von Glasersfeld, 1987, 1989; Steffe, 1990; Tobin, 1990) to interpret to what extent, and in which specific curricular and pedagogical content instances (Shulman, 1986, 1987), considerations of ethnicity and cultural diversity entered the instructional practice of two science teachers in an American public school characterized by extreme cultural and ethnic diversity among the students.

Interactions between the teacher and students made up a "consensual domain" (Manturana, 1978) that defined the learning field in which teacher decisions were located.

Methods

The research methodologies used in this study were qualitative (Erickson, 1986) and social contextual (Ogbu, 1981; Charron, 1991). Case studies were conducted of the teaching practices of the two participant teachers over an extended time. A systematic investigation was conducted of the social contexts that focused on multicultural considerations, i.e. ethnic and racial demographics and historical events.

Data Sources

Research Site

The research site was a public middle school (grades 6 to 8) that had increasingly become ethnically diverse over the preceding five years. Previously, the school was essentially bicultural (95% White, 5% African American) in a predominantly White school district located in Georgia. The school was referred to pseudonymously as World Middle School.

Participants

Participants in this study included two middle school science teachers (pseudonymous "Mrs Guide," who taught seventh grade life science, and pseudonymous "Mr Green," who taught eighth grade earth

science) and their students in one culturally diverse public middle school. The two participant teachers were a White female with nine years teaching experience and White male first year teacher. Additional informants included community members, a retired teacher, the life science teacher's White female student teacher, and several school employees.

The student participants were African American, White, Asian (Chinese, Cambodian, Korean Japanese, Thai, and Vietnamese), Romanian, Hispanic, and Middle Eastern. The percentage of non-mainstream international and African American students in the classrooms exceeded 40%. White students made up the remainder of the students.

Data Tools

Interactive research tools used included participant observation, interviews, and stimulated recall of videotaped lessons and activities. Noninteractive research tools used included researcher journal, proxemics and kinesics, and artifact collection (Goetz and LeCompte, 1984).

Before-teaching and after-teaching decision-making data were obtained through semi-structured and informal interviews with the teacher participants conducted before and after researcher observed science lessons. These interviews were audiotaped and transcribed. An adaptation of the clinical supervision model was employed (Sergiovanni, 1985).

During-teaching decision-making data was based on field notes and on an analysis of twelve videotaped science lessons. The

videotaped lessons were edited after the field-based component of the study ended. Representative teacher pedagogical interactions with non-mainstream students were selected. These were referred to as Teacher Practice Critical Incidents, TPCI. The participant science teachers received a copy of their TPCI and audio recorded their reflections of those edited instances (sixty-six for the life science teacher and forty-nine for the earth science teacher) as they privately viewed their videotapes. Their responses were guided by structured interview protocol. In their reflections, the teachers focused on their rationale for the use of the pedagogical strategy observed and were asked to identify any alternative pedagogical strategies they considered during the teaching instance viewed.

Summary and discussion of findings

In 1981, Shavelson and Stern asserted that teachers act as professionals and independent thinkers, who are constantly making decisions in an uncertain and complex environment. Influenced by that assertion, science education researchers such as Olson (1982), Aikenhead (1984), and Duschl and Wright (1989) established a science teacher decision-making research program. In this present study, the focus was on an unexamined, but critically important area: science teacher decision-making in culturally diverse classrooms.

This section is divided into three parts: Part A contains a summary of the findings structured around a priori and a

posteriori research questions; Part B contains an interpretation of the findings using semiology; and Part C contains implications of the findings for educational research focusing on ethnically diverse populations.

Part A: Summary of A Priori and A Posteriori Research Questions

A Priori Research Questions

The guiding a priori research question in this study was:

1) How are pedagogical decisions of science teachers influenced by the students' cultural and ethnic backgrounds?

Summary: Only in a few, discrete instances were the two participant science teachers' pedagogical decisions influenced by the students' cultural and ethic backgrounds. Mrs Guide's pedagogical decisions that were influenced by her student's cultural diversity were to repeat individual student answers she thought important for the whole class (so that all students, including those students whose first language was not English, would have an opportunity to hear and learn from the answers), to give students who were still learning English repeated opportunities to answer questions (so that they could work through communication problems and be able to display the life science knowledge they possessed), to select the class or school as a referent for life science application examples (so that all the students would have a common referent point, even those students who led very different lifestyles due to their cultural and ethnic

backgrounds), and once to allow her students to use their ethnic differences in an application problem in ecology in life science (so that they could apply their differences productively in a science problem).

Mr Green's one pedagogical decision that was influenced by his student's cultural diversity was to allow his English-for-speakers-of-other-languages (ESOL) students to sit together and work together in a cooperative learning group (so that he could better monitor them and provide assistance during small group learning activities).

The paucity of instances observed in which the cultural and ethnic differences of the students influenced the teachers' pedagogical decision-making was congruent with the beliefs the teachers' held. While the two White participant science teachers promoted the cultural and ethnic differences of their school and saw themselves on the forefront of teaching culturally diverse student populations, they both strongly held a belief that kept them from considering the cultural diversity of their students during almost all of their pedagogical decision-making. The teachers strongly held the belief that they should think of their international and African American students as the same as their White students when making pedagogical decisions. This belief was contained in the analytical categories <u>They Are All Kids To Me (In School)</u> for Mrs Guide and <u>They Are All Kids To Me (But the Black Kids Do Distinguish Themselves</u>) for Mr Green.

The teachers did not want to emphasize their students'

differences in class because they believed that would lead to promoting separatism. The result was that they consciously aimed at not having their pedagogical decisions influenced by the students' cultural and ethnic backgrounds. They justified their belief in student universalism by claiming that since their students were in their science classes in their city, county, state, country, the students made the decision to learn science the way it was traditionally taught in that social context. The social-contextual analysis recommended by Charron (1991) and others (Ogbu, 1981; Peshkin, 1991; Wilcox, 1982) asserts that "social beings and events are so closely tied to their surroundings as to be inseparable in real life as well as for research purposes" (Charron, 1991). The social-contextual analysis conducted in this study offers the insight that the participant science teachers did not want to promote 'separatism' by considering their students' cultural and ethnic differences when making pedagogical decisions.

The state, county, city, and school in which the research was conducted has a history of separation between two ethnic groups, Whites and African Americans. Less than 35 years ago, separation of the two ethnic groups was both a legal and accepted social practice. Segregation was a distinguishing feature of the public education systems, and integration of the state's public schools came only after the U.S. Supreme Court decision in Brown vs. Board of Education of Topeka. Even then, it was enacted only through the federal government's continual insistence in this state years

later. Segregationists in the state's Education Association endorsed "Separate but equal" schools in 1955. 'Separatism' is now generally associated with racism in this state. Treating all students the same, no matter how diverse their backgrounds are, and only separating them according to ability (e.g. giftedness) indicated by standardized tests is considered the safest professional stance for teachers today in this state's schools. Therefore, considering students' cultural or ethnic backgrounds, even when the intent is to more fully acknowledge their different characteristics to assist with more effective science education instruction in pedagogical decision-making, suggests 'separatism' and should be avoided.

The teachers' belief that they should not consider their students' cultural and ethnic backgrounds also fits in well with teacher's time honored pattern of practice to 'be fair' and not to favor any one student over another and not to discriminate against one student over another.

Alan Peshkin (1991) also found in his year-long ethnographic study of teachers in a culturally diverse school high school in California that they "disregard[ed] ethnicity at the same moment that they clearly ha[d] it in mind" (p.129). Peshkin argued that the teachers in the school were more or less left on their own to devise a way to teach their diverse students, so they taught their international and African American students in the way that best fit the teachers' view of teaching and learning in this country. The result was they taught all students as if they were of the same

cultural and ethnic background and held views of "universalism, assimilation, and color-blindness" (p.154). This kept the teachers from explicitly asking: "Does student ethnicity constitute a fact with instructional consequences?" (p.265). The participant science teachers in this study did hear that question from the researcher and answered with a strong "No." It was observed, however, that in isolated instances during teaching that one or the other participant teacher did make pedagogical decisions described by the multicultural issues English as a second language, cultural lifestyles, and overt acknowledgement of student differences.

2. How do the teacher's pedagogical decisions influence students' behaviors during instruction?

Summary: The central pedagogical decision Mrs Guide and Mr Green made was to make hands-on cooperative learning group activities their primary instructional style to teach life science and earth science. Lessons indicated their students generally stayed on task during class time. An analysis of the proxemics and the kinesics of the participant teachers during their lessons was discontinued mid-way in the study when it became apparent that the likelihood of that research strategy contributing insights in this study was minimal. Observations indicated that both teachers moved throughout their classrooms, working individually with the small cooperative groups. No group of students in either class was observed to receive less attention than any other group in the class.

In Mr Green's eighth grade earth science class, one pedagogical decision he made influenced both his ESOL students' behavior and the other students behavior toward them in the class. Mr Green allowed his ESOL students to sit together and work together in one small cooperative learning group in the back of his classroom. He gave all his students the freedom to choose their cooperative learning team members, and the three male ESOL students chose to work together. Although Mr Green was concerned at one point early in the study that the ESOL group, or as he referred to them, "the international group," did not have a leader, he decided to let them remain together. Mr Green found it convenient to give them extra help during activities. Mr Green was observed many times giving the international group his personal attention during laboratory and other manipulative experiences. What the researcher also observed was the interpersonal isolation of the ESOL students in Mr Green's earth science class by other students in the class.

In the researcher's observations of Mr Green's class over the two six-weeks grading periods, he observed no instance of the ESOL students in Mr Green's class interacting with other students in the class. During class, the ESOL students took notes, made comments to each other, and talked with Mr Green if they had a question. During class discussions, they stayed quiet or disregarded the discussion and talked with each other or rolled coins between each other on their table. Of the ESOL students, during the study period, the researcher observed only the male Romanian student

called on (twice) by Mr Green to answer whole class questions.

Puzzled by the ESOL students' isolation in Mr Green's class, the researcher first discussed the grouping of ESOL students with one of the ESOL teachers at the middle school:

> Researcher: What kind of a mix do you feel is appropriate in cooperative groups? For example, would you recommend the limited English proficient students to be grouped together?
>
> ESOL Teacher: There are a couple of different strategies for that. In this school where the number of 8th grade ESOL students is not that great, I think it is good to have one in a group with kids who are helpful...(interview, 6/9/92).

The researcher next asked other students in Mr Green's class questions about the ESOL students to see if their isolation was an artifact of the researcher's limited observations. The analytic category that emerged from their responses was referred to as <u>The ESOL Kids Stay to Themselves</u>.

Other students in Mr Green's earth science class noticed the ESOL students' separateness thinking that they wanted to stay to themselves. They said they did not associate with the ESOL students because the ESOL students did not make the effort to talk with others in the class. In answer to the researcher's inquiry about the origin of the ESOL students, students he asked did not know their names or much about their backgrounds.

Finally, the researcher consulted the literature for guidance on how to teach linguistically diverse students. He noticed that programs for students whose first language is not English vary (e.g. immersion, immersion with augmentation through ESL/ESOL programs, and bilingual) (Ramsey, 1987). The program at World

Middle School was an ESOL program which augmented an immersion program. The limited English proficient students were expected to learn English by spending most of the school day in classes in which English was the only language spoken and a portion of the school day in a class studying English with other limited English proficient students. According to Santos (1990), the recommended grouping practice of students in that type of program is full integration and sharing among English speaking students and speakers of other languages. Otherwise limited English proficient students were in danger of

> attend[ing] regular classes languishing in the shadows of their English-proficient classmates....[their teachers and fellow classmates] know nothing of their culture, language, or educational needs.(p.4).

Cardenas (1986) also referred to the "alienation that [limited English proficient] children frequently face when they are pushed into an unfamiliar language situation" (p.361).

The result of Mr Green's pedagogical decision to allow his ESOL students to sit together and work together in cooperative learning activities was that they were socially isolated in the class. The other students did not fully benefit from the ethnic and cultural diversity that the ESOL students brought to the class.

3. How does the cultural and ethnic background of the teacher influence the decisions made by the teacher in a multicultural classroom?

Summary: This provocative question proved tantalizing but unanswerable in this study since neither of the teacher participants explicitly associated their cultural or ethnic

backgrounds with specific pedagogical decisions they made in their culturally diverse classrooms. It was evident to the researcher, however, that the teachers' culture and ethnicity factored in their world views. Both Mrs Guide and Mr Green comfortably referred to themselves as White Americans. Mrs Guide and Mr Green felt pride in their culture and promoted Americanization for their students. They believed their students and parents supported Americanization by choosing to attend their public middle school. Mr Green identified himself as a "male Southern American" and thought his international students could become American if they wanted, but never Southern Americans. Mr Green believed his students would have to be born in the south and then adopt southern customs to be considered "Southern."

Although the degree to which these factors impacted the teachers' pedagogical decisions was too complex to isolate here, it is the researcher's opinion that their cultural and ethnic backgrounds played a part. Like Peshkin (1991), the researcher believes that ethnicity

> has significance in its own right [but] separating it significance from social class, age, gender, interests, and aspirations is more than I can do...Ethnicity is present without determining. Like an unseen hand, it leads and guides, but always in the company of other factors (p.282).

A Posteriori Research Questions

Relevant research questions in this section developed after the field-base component of the study began. This section is divided into two parts: beliefs and decisions.

Individual's beliefs are part of belief systems which are loosely-bounded, highly variable, and linked in some unknown way to events, situations, and knowledge systems (Kelly, 1955; Nespor, 1987; Clark and Peterson, 1986; Munby, 1986; Tuan, 1990). Individuals' beliefs are different even if they are formed in the same environment during the same time. Belief systems are distinguished from knowledge systems in being composed of nonexistent entities, ideal situations, evaluations and feelings, and personal experiences (Nespor, 1987). The most rigorous manner to identify beliefs is the repertory grid method (Munby, 1986), but participants' reflections is also a recommended technique.

Methodology To Determine Beliefs: In this study on teacher decision-making with ethnicially diverse students, the researcher's primary sources of data for participants' beliefs were audiotaped and transcribed informal and formal interviews and audiotaped and transcribed reflections of edited portions of videotaped science lessons. In the interviews, participants reflected on their learning and teaching practices and in the reflections on videotaped portions of their science lessons, teachers described their rationale for their actions shown in the video edit and identified alternative teaching strategies they considered. Analytic induction (Glaser & Strauss, 1967) was used to develop categories for participants beliefs.

Questions and Summary: The first a posteriori research question was the following:

1. What beliefs do teachers of culturally diverse

students hold about their students?

Summary: Two analytic categories emerged from the data for Mrs Guide's beliefs about her culturally diverse students. They were They Are All Kids To Me (In School) and Their Differences Are Obstacles To Be Overcome.

They Are All Kids To Me (In School): Mrs Guide believed that her students all shared the quality of being "kids" and that their common goal was to be successful in her science class as she created it in a public middle school in American. She recognized that her students could be thought of as different after school but that was overshadowed by her central belief that "kids were kids" during school instruction of life science.

Their Differences Are Obstacles To Be Overcome: Mrs Guide preferred to believe that her students could be considered the same during school for instructional purposes (the exception being those with language needs). Differences in the students' values, morals, customs, and beliefs were challenges to Mrs Guide that needed to be overcome if international and African American students were to succeed in science as she taught it in her public middle school.

Two analytic categories emerged from the data for Mr Green's beliefs about his students. They were They Are All Kids To Me (But The Black Kids Do Distinguish Themselves) and Adults Can Learn From Them.

They Are All Kids To Me (But The Black Kids Do Distinguish Themselves: Mr Green strongly held the belief that his students were all "kids" who basically behaved the same because they were

adolescents living in the same area, going to the same school, engaging in the same activities, and hanging out in the same place in the community. A difference he did acknowledge was their religious backgrounds. Although Mr Green fundamentally believed all his students shared the quality of being "kids" and did not separate themselves by ethnicity, he did mention that he did believe that his African American students had a tendency to distinguish themselves by congregating and being louder and more "boisterous."

Adults Can Learn From Them: Mr Green believed that his students found common ground to interact with each other positively and did not counterproductively emphasize their differences. He believed that even his most culturally different students, his international students, wanted to become Americans and act like Americans. Overall, he believed that society, or adults, could learn how to get along in a culturally diverse society by emulating how he perceived his students did it--by not taking their differences seriously, by working together and not separating themselves, and by conforming to a common code of behavior.

In summary, both participant science teachers held the belief that their diverse students should be perceived as just kids at school. Cultural and ethnic differences were on the whole considered obstacles to instruction. The students ability to intermingle peacefully at the school without overt consideration for their cultural and ethnic differences was perceived as a model for society in general.

The second a posteriori research question was the following:

2. What beliefs do students in culturally diverse science classrooms hold about learning science in a multicultural environment?

Summary: Findings indicated that Mrs Guide's seventh grade students had formed opinions on whether they liked to learn life science in a multiethnic classroom and on how they liked to be taught science in that type of environment. The students' beliefs were grouped under the analytic categories It Broadens Our Perspective and Let Us Work Together.

It Broadens Our Perspective: Students consistently expressed a preference for learning life science in a multiethnic classroom. The principal reason given for that preference was that it was believed to increase their exposure to other ideas on how life science could be taught and how other ethnic groups think (primarily about life in general rather than about the subject matter). Furthermore, through working with the international and African American students in all the academic subjects (science included), White students in particular felt better prepared for life in the greater society. Those students perceived American society to be multiethnic and they wanted to be prepared to live and work in it. They felt that if they did not associate with the non-White population in the school, there was the danger of becoming "racist or something" (White male, interview, 4/30/92). The same student noted that in a multiethnic school, "You can't be discriminatory."

Let Us Work Together: Mrs Guide's students supported the idea of being taught in a culturally diverse environment. Students recommended dyads and cooperative groups so that students could "communicate" and "get to know each other" (White female, interview, 5/7/92). But students believed that mixing the groups was not the exclusive responsibility of the teachers. The White students felt that eventually a international or African American person would get around to them.

Mr Green's eighth grade students had formed opinions on whether they liked to learn earth science in a multiethnic classroom and on how they liked to be taught science in that type of environment. Their beliefs were described in the analytic categories Everyone Is Human, The ESOL Kids Stay To Themselves, and Don't Give Me a Teacher With An Attitude.

Everyone Is Human: Mr Green's students thought the culturally divers earth science classroom completely normal and expected the arrangement. After several years in a multicultural school environment the novelty effect of studying with different types of people had disappeared. By eighth grade, they fully expected all types of people to be included in school activities, including earth science. They didn't mind sharing their cooperative learning groups in earth science with people of different cultures, but primarily they sought to group themselves with friends. They perceived friendships in the school as being cross-cultural, so they believed they were not being separatists in their choices for members of the cooperative learning groups.

The ESOL Kids Stay to Themselves: In Mr Green's earth science class, his three ESOL students sat together in the back of the center row of student tables. Another international student who was frequently absent and not in the ESOL program joined them when he was present. Throughout the research period, the ESOL students were never to talk with other students in the earth science class. They sat with each other in every cooperative learning group activity. They even walked together to a special assembly during earth science and sat together behind the other students in their class in the large meeting room. They made no effort to talk with other classmates, who in turn assumed the ESOL students preferred their separate group.

Don't Give Me A Teacher With An Attitude: Teachers at Mr Green's middle school did not reflect the ethnic background of the students. The faculty at the middle school was predominantly White female. Two students (female Half Korean American and a Thai female) made it clear to the researcher that they believed it unnecessary to have a faculty representative of the cultures in the student body. It was necessary, however, that their teachers be open-minded and unprejudiced. Students also wanted science teachers who knew their science subject matter and who made science interesting by emphasizing laboratory experiments.

In summary, Mrs Guide's seventh grade life science students and Mr Green's earth science students had well formed beliefs about studying science in their culturally diverse school. Both valued the opportunity to learn in a multiethnic school because they

believed it prepared them for a multiethnic society. As a result, they recommended the pedagogical strategy that gave them the best opportunity to intermingle with different students, small cooperative learning groups. One note of caution concerning cooperative learning groups was expressed by the eighth grade earth science students. They found that placing the ESOL students in one group separated them from the other students and caused them to be perceived as not wanting to intermingle with the other students. Although students did not object to a lack of cultural diversity in their teachers, they wanted teachers who were not prejudiced in their actions with them.

Decisions: In planning this study, pedagogical decision-making was conceptualized as requiring the consideration of alternative strategies. The videotaped teaching practices (TPCI) which the researcher presented to the teacher participants were edited segments from their videotaped lessons that contained actions considered likely candidates for decision-making incidents. Surprisingly, the teachers could not provide alternative teaching practices for a majority of teacher actions the researcher selected (40 out of 66 for Mrs Guide; 21 out of 49 for Mr Green). The a posteriori research question that emerged from this finding was the following:

3) How could teachers' actions involving non-mainstream students for which they consider no choices be understood?

Summary: Researchers such as Tobin and Espinet (1987) have reported in the literature the phenomenon of experienced teachers

not being able to articulate the beliefs and rationales that guided the selection of some teaching practices. The traditional explanation offered to explain this inarticulateness is that the actions are indications of subconscious teaching routines not readily accessed by conscious thought that have been developed by trial and error over time. Although in this study, both the first-year White male earth science teacher and the nine-year veteran White female life science teacher easily provided rationales for their actions. They found it difficult to think of alternative strategies.

Mores are defined as folkways of central importance accepted without question and embodying the fundamental moral views of a group (Urdang & Flexner, 1973). The researcher believes teacher actions for which no alternatives are seen give insight into the idiosyncratic cultural teaching mores held by teachers that guide their teaching practices. These mores relate to generally accepted right and wrong teaching behaviors. For example, in this country the teachers held such cultural teaching mores as providing students assistance with questions, allowing students to demonstrate their knowledge, using relevant examples, and intervening to stop off-task behavior. Science teachers recently educated in programs well-grounded in current research, probably hold the science-specific mores of selecting hands-on activities over lecture and placing students in small cooperative learning groups.

The researcher's strategy in this study was to examine the

rationales for the teacher actions with no alternatives, which the researcher termed ritual instructor-action practices (ritual designating customary practices that are in a set form (Urdang & Flexnor, 1973)). The researcher found through the use of analytic induction (Glaser & Strauss, 1967), that for both Mrs Guide and Mr Green a limited number of categories (nine and seven) contained their ritual instructor-action practices, abbreviated to ritual i-action practices. Their mores were idiosyncratic, perhaps indicating different teacher education philosophies, different prior experiences with teachers as students, and different experiences as teachers.

Examples of Mrs Guide's mores were that the teacher should emphasize content that will be the basis or students' assessments and the teacher should give detailed directions for students in new activities. Examples of Mr Green's mores were that the teacher should allow students the most freedom possible in class because that makes them happy and they work harder when they are happy and the teacher should give students an advance organizer at the beginning of class.

The heuristic power of regarding teacher actions without alternatives as ritual instructor-action practices and then analyzing them for cultural mores of teaching was substantial. This conceptual method provided insight into the teaching practice of the two participant teachers that would not have been as readily noticed otherwise.

Part B: Interpretation of Findings Using Semiology

Man is the measure of all things.
Protagorus (c. 490-421 B.C.)
(Levey & Greenhall, 1983)

The theoretical framework of this study is constructivism. The definition of constructivism comes from Von Glasersfeld (1989) who defines constructivism as a form of pragmatism, and as a theory of knowledge. Knowledge is asserted to be actively built up by the cognizing subject and the function of cognition is adaptive. Cognition serves to organize the experiential world, not to discover an ontological reality.

Steffe (1990) presents a constructivist vision of teaching and learning in school settings. He states that learning occurs in organizing experience in an environment and that teaching "consists in the interactive communication in a consensual domain of experience" (p.9). On the basis of this theory, it became imperative to make sense of the environment, World Middle School, in which the participants of this study carried out their interactive communication with their culturally diverse students. The interpretative technique the researcher choose to use is semiology, the science of signs.

Semiology was chosen because semiology is compatible with the epistemology contained in a radical constructivist theoretical framework. Semiology places an emphasis on the role of the interpretant to generate insights in an environment. No one correct interpretation is asserted to exist in a semiological analysis that can be validated by a reality check. In fact, advocates of semiology stress that different readings

(interpretations) are possible by different readers (interpretants), of a text (environment) (Groisman, Shapiro, & Willinsky, 1990).

This section is divided into three parts. The first piece contains a brief description of semiology. The second piece contains a semiological analysis of the environment of World Middle School. The third piece interprets the findings of the science teacher decision-making with culturally diverse students using insights gained from a semiological analysis.

Semiology

Semiology, or semiotics, is the study of signs. It is a form of structuralism, the general term for the analysis of cultural products using the tenets of linguistics (Levey & Greenhall, 1983). The American philosopher Charles Saunders Pierce (1839-1914) and the Swiss linguist Ferdinand de Saussure (1857-1913) are credited with initiating the modern form of semiological analysis. Today, Roland Barthes (1970), France, and Umberto Eco (1976), Italy, are the leading theorists in semiological analysis (Berger, 1991).

In a brief outline, semiology is concerned with how meaning is generated and conveyed in a text. Texts can be defined as any environment that interpretants analyze for meaning. It is helpful to refer to Saussure (1966) in defining the realm of semiology:

> A science that studies the life of signs within society [emphasis in original text] is conceivable; it would be a part of social psychology and consequently of general psychology; I shall call it semiology (from Greek semeion "sign"). Semiology would show what constitutes signs, what laws govern them. Since the science does not yet exist, no one can say what it would be; but it has a

right to existence, a place staked out in advance (p.16).

The purpose of semiology is to expose the hidden structures of communication within environments. Communication is not confined to verbal interaction but also uses other means, such as by objects and images. Signs and relations are the key notions of semiological analysis.

The sign is the smallest unit of meaning in semiology. A sign is not an object, but a function. It serves to associate an expression (referred to as the signified by Saussure) with a concept unit (referred to as the signifier by Saussure) formed in a cultural setting.

Linking or connecting expression and concept is social and depends upon the perspective of the observer (Manning, 1989). Pierce (1958) argued that every sign requires an interpretant. The interpretant links the expression and the content. The association made between signifier and signified and among signs are mental. Oftentimes the association is revealed by the presence of a metaphor, a synecdoche, or a metonymy.

Pierce (in Berger, 1991) focused on three aspects of semiotic signs: iconic, indexical, and symbolic. Iconic signs are distinguished by the signified displaying a resemblance of characteristics of the signifier, e.g. a color diagram in the textbook for the elliptical orbit of the Earth. Indexical signs are distinguished by the signified and the signifier being causally connected, e.g. smoke and fire, or the wind vane and the wind's direction. Inference are associated with indexical signs.

Symbolic signs are distinguished by conventions in a cultural setting, e.g. different flags for different countries or different glassware for different chemical solutions. Acculturation is associated with symbolic signs.

Since multiple interpretations by multiple interpretants can exist between signified and signifier, to convey meanings, signs must be embedded in social conventions that members of communities learn. These social conventions are termed codes. One feature of codes is that generally "people are not consciously aware of the rules and codes and cannot articulate them" (Berger, 1991).

A semiological analysis helps to make meaning in environments by analytically deciphering codes and bringing them to consciousness. The interpretant seeks to create a code that makes sense of the principles that underlie the interrelated signs that members of the environment use to communicate (Berger, 1991). Such an investigation seeks to explain environmentally sanctioned practices.

In addition, semiotics seeks through the process of semiosis to explain the process of the generation of signs. The generation of signs is postulated to result from a tension between two forces: personal construction of meaning and social construction of meaning (Groisman, Shapiro, & Willinsky, 1990).

Semiotic Analysis of World Middle School

World Middle School was a culturally diverse student community taught primarily by White teachers in a county that was experiencing tremendous population growth in a Southeastern state.

A code that contained two antithetical themes provided insight into the findings of teacher pedagogical practices. The code could be described as A Code of Contradiction. Exemplar signs for the two antithetical themes contained in the code were communicated in two prominently placed wall displays at World Middle School.

The first theme of the code was communicated through the exemplar sign found in a wood framed photographic wall display placed immediately outside the main office. The display included sixteen color, large matted photographs which showed teachers and students interacting in various learning situations. Students of different gender and of different ethnic groups (White, African American, Asian, Indian) were prominently shown in school settings using computers, working in laboratory activities, and harmoniously intermingling with each other in class. All the teachers displayed were Whites who were either supervising the equipment the students were using or were in the center of grouped students.

In the center of the wall display was an even larger matted poster with the following motto handwritten in three colors (first line blue, second and third line brown, and the fourth line black):

WORLD MIDDLE SCHOOL:

OUR DIFFERENCES

MAKE US

UNIQUE!

In this sign, the signifier was the display of photographs of culturally and ethnically diverse students depicting them actively

engaged in school activities mingling harmoniously with their peers under the supervision of their White teachers. The signified was the concept that being culturally and ethnically different was a valued characteristic of the school and should be emphasized, acknowledged, and communicated.

Other signs in World Middle School that promoted a similar communication were a framed award from the state's governor to the school for excellence in teaching the culturally diverse, posters in the hallways promoting international dinners and events, different country's flags hanging in the school cafeteria, a display set up in the school cafeteria that contained translations of international languages for American food, and the presence of the ESOL program located in a trailer next to the school building. The researcher's presence in the school was also a sign which promoted a similar communication to those informed of his research focus.

A sociological concept studied in multiculturalism that corresponds with the communication of those signs in World Middle School is cultural pluralism. Baptiste (1988) credits Horace Kallen in his book, Cultural Pluralism and the American Idea, to have first proposed the concept cultural pluralism. The premise behind his theory was that society is pluralistic and that various cultural groups describe American society. In the 1960s cultural pluralism took on different meanings that included being prescriptive. Neo-cultural pluralism states that America should strive to maintain a balance of power between competing and

overlapping different cultural groups. Differences between groups are to be prized and maintained instead of forcing society to become homogenized.

The second theme of the code was communicated through the exemplar sign found in a display of a large (8 by 1.5 meters) blue paper wall poster that was put up outside the school lunchroom. This poster included the Olympics symbol, two drawing of the Earth in space with continents prominently displayed--one at each end of the poster, and foreign expressions scattered throughout the poster (e.g. Guden tag, unidos huntos and others in international characters). A computer printed motto in large letters filled in by hand with different colors was attached above the poster. It read:

DIVERSIFIED CULTURES FOR A UNITED PURPOSE

In this sign, the signifier was the display of drawn Earths shown hovering in space, international expressions of unity, and the drawn Olympic Rings. The signified was the concept that cultural and ethnic diversity could be subjugated for a higher purpose. Cultural and ethnic and other differences were best when they united to accomplish common goals.

Other signs in World Middle School that promoted a similar message were students walking together in single file toward and from the school lunchroom supervised by their teachers, students sitting at designated class tables in the school lunchroom,

students heterogeneously assigned to classrooms, and students' names listed under academic and attendance ranking categories contained on posters hung on walls outside of classrooms.

A sociological concept studied in multiculturalism that corresponds with the communication of those signs is the melting pot. Israel Zangwell popularized this theory in his Broadway play entitled "The Melting Pot" in the early 1900s. The melting pot theory proposed that all groups would contribute on a parity basis to the creation of a better group that would pursue a common purpose (Baptiste, 1988).

Teaching Practices of the Participant Science Teachers

In their interactive communication with their students, the participant science teachers followed the Code of Contradiction communicated in signs at World Middle School. Essentially, the teachers prized their students' diversity, but they taught them the same county-provided curricula and attempted to treat them all the same way.

Mrs Guide and Mr Green, the participant science teachers in this study, expressed sentiments congruent with the first exemplar sign. In interviews and in conversations, the teachers extolled the virtues of their school's culturally and ethnically diverse student population. They believed that the international student population at World Middle School was a positive contribution to the community's perception of their school. They also believed that World Middle School was on the forefront of demographic changes that most public schools in America would experience in the

immediate future. They valued the diversity of their science students, and they did not desire to teach a culturally or ethnically homogeneous population. Mr Green believed that American society could even learn from how the different groups of students mingled peacefully in World Middle School [described in the analytical concept, Adults Can Learn From Them].

In their pedagogical decision-making, both teachers selected to use cooperative groups in their instructional practices. Those groups allowed diverse students to work together to construct meanings that related to their county objectives. Mrs Guide took more control in mixing her students while Mr Green assumed a more laissez faire attitude. He naturally expected group mixing to occur over time.

Mrs Guide and Mr Green also expressed sentiments congruent with the second exemplar sign. They both held the belief that the students should be considered the same during science instruction [described as They Are All Kids To Me (In School) for Mrs Guide and They Are All Kids (But the Black Students Do Distinguish Themselves) for Mr Green]. To them, if learning science was the common goal, it required the students' cultural and ethnic diversity to be overcome if learning were to be accomplished. Separatism was a threat in the classroom and was not to be encouraged.

In practice, both teachers' decision-making was characterized by the use of curricula that contained materials and teaching styles related to a common middle school student culture [described

as I Make It Relevant for Mrs Guide]. References to issues more relevant to one cultural or ethnic group than others were rare, student initiated, and not planned ahead of time by the teachers (the exception being concern for those students with language difficulties).

The "created curriculum" (Steffe, 1990) developed in the two science classrooms as a result of ongoing teaching and learning therefore was characterized by a learning field in which the teachers did not deliberately include consideration of the pedagogical content value of the diverse cultural and ethnic backgrounds of the students. Doing that would have been in conflict with the second aspect of the Code of Contradiction of the school.

Many of the learning situations the teachers selected in their pedagogical decision-making (primarily small cooperative learning groups) did, however, promote interactive communication among the students. That matched the first aspect of the Code of Contradiction of the school which promoted student mingling. The interactive communication, however, was limited to achieving the common goal of the county's instructional objectives so it also matched the second aspect of the Code of Contradiction in World Middle School.

In the daily compromise the teachers made between teaching the process and the product of science, in varying degrees, product was favored due to assessment demands. The "science of children" (Driver, 1990) was acknowledged by the teachers but was rarely

pursued in the science lessons due to perceived time constraints.

Taylor (1990) described the epistemology of a teacher as 'transitional constructivist' who used a student-centered pedagogy that promoted social interaction, but maintained a curriculum imposed from outside the classroom interactive communication between teacher and students. Both Mrs Guide and Mr Green's epistemologies also fit that description.

The purpose of this semiological interpretation was to make meaning of the teachers decision-making through explicating one interpretation of the school's communication code. The major insight that emerged from this exercise was that the contradiction communicated in signs in the larger environment of the school was analogous to the contradiction demonstrated in the teachers' pedagogical decisions made in the science classrooms. The students' cultural and ethnic differences were valued in the social sphere, but the teaching and learning sphere was reserved for only a uniform culture.

Part C: Implications Of Study

In this study, the two participant science teachers did not consider their students' diversity an instructional resource to be used by them to enhance their teaching of science. The students' diversity was perceived by the teachers as an obstacle which had no positive contribution to make in the sphere of teaching and learning.

However, leading researchers, including science educators in

multicultural education (e.g. Atwater (1989, 1991); Grant and Sleeter (1986); Baptiste (1988); others), and social science educators involved in multicultural education (e.g. Banks (1981, 1988); Tiedt & Tiedt (1986) and others), and national professional teacher organizations (e.g. The National Science Teachers Association (NSTA), have all called for the inclusion of multicultural considerations in teaching decision-making practices. The NSTA position statement on "Multicultural Science Education" states:

> Curricular content and instructional strategies selected for use with culturally diverse children must reflect, as well as incorporate, this diversity (NSTA, 1991).

The growing body of literature on multicultural education provides an outline on how to work toward culturally sensitive instruction with diverse students (Protheroe & Barsdale, 1991). The first step recommended is to recognize that mainstream schools are most often structured to operate in a manner most frequently described as conforming to "middle-class European American cultural standards" (p.8). Typical organizational and cultural features of mainstream classrooms include the teacher selecting the topics for discussion and allocating turns to talk; one person allowed to speak at a time; individual competition favored over group competition; and topics introduced in discrete, sequenced steps. Cultural conflicts is hypothesized to arise between the schools and students from different cultural backgrounds which is reflected in the students failing to achieve. A commitment to mitigating the clashes between the school's culture and the students' cultures,

while not assumed to solve all the problems of low achieving ethnic groups, is considered to be a prerequisite in implementing changes in small-scale instructional practices to improve communication and create a supportive classroom environment for diverse students. Areas in which cultural conflicts have been identified that affect cultural groups include social structures (Trueba & Delgado, 1985), cognitive styles (Anderson, 1988), nonverbal and verbal communication (Delpit, 1988), and acculturation (Olsen, 1988).

The second step in instituting culturally sensitive education, once potential cultural conflicts have been identified in a school, is facing the challenge of modifying teaching techniques and environments to match the cultural patterns of the student population within its own unique cultural environment (Protheroe & Barsdale, 1988). This is a relatively unexplored, and controversial area of research and practice, particularly so with multicultural student populations as opposed to homogeneous non-mainstream student populations. Insights from influential research programs with single cultural students, such as the Kamehamaeha Early Education Project (KEEP) in Hawaii, have, however, indicated that positive increases in student achievement can be achieved with a minimum of changes in teaching techniques and within the school environment (Protheroe & Barsdale, 1988). The challenge to develop appropriate multicultural education practices for targeted populations remains for teachers and school administrators with culturally diverse students and for interested educational researchers. Complimentary beliefs that support this effort are

that different ways of learning is an instructional asset and that attending to those differences does not conflict with preparing students to function within mainstream culture.

The implications for this study related to multicultural education lie in three levels: epistemology, higher education, social context. Following a discussion of each level, the researcher presents a schema of the participant teachers' decision-making that focuses on multicultural considerations.

The implication on the first level, epistemology, relates to constructivism. Constructivism, the prevailing theory of teaching and learning in education, logically supports teacher's consideration of the students' cultural and ethnic backgrounds. Constructivist teaching of students involves the creation of a "consensual domain" in which students and their teacher act recursively as "structurally plastic systems" (Manturana, 1978, p.48). That is manifested in the science classroom by social negotiation of meaning by the students and the teacher (Bauersfeld, 1992; Gergen, 1977).

In order for teachers to engage in the necessary ongoing interactive communication involved in a consensual domain with students, they must modify their environments to fit the environments of their students:

> The teacher's environment then includes interpretations of her student's [science] environments as well as her own [science] environments. (Steffe, 1989, p.8-9)

Accomplishing this act with diverse students involves a commitment by the teachers to include consideration of the

differences they bring to the learning field. Research by Saxe (1988) and Barba (1992), illustrate the varying culture-of-origin beliefs students hold which teachers must interpret to join students in a consensual domain. Professional teachers holding the constructivist epistemology are thought to demonstrate this commitment during instruction.

However, findings in this study suggest that teachers, who are prepared in teacher education programs that promote constructivist practices, do not necessarily include multicultural considerations in their pedagogical decision-making. The question to be investigated is whether the interpretation of constructivism taught in their teacher education programs excludes the multicultural consideration or if other factors restrict teacher's inclusion of multicultural consideration in their interpretation of constructivism.

The second implication focuses on higher education. Higher education in this section refers to science education research and science teacher education. An implication for science education research follows from the increasing acceptance of Shulman's pedagogical content knowledge as an organizing structure of science teacher education courses. The science education research community needs to develop a multicultural knowledge base for each science discipline. That knowledge will encourage teachers to use the cultural diversity of their students in teaching science. It would be distinguished by both specific examples of content of special relevance to diverse students and by appropriate interpersonal

communication skills associated with different ethnic and cultural groups. Interpretative studies in culturally diverse classes conducted in a similar manner as this study are recommended for obtaining specific examples of content of special relevance to diverse students and which also interest other students. Research such as Anderson's (1991) concentrating on teaching and student learning styles are also recommended for insights concerning appropriate interpersonal communication skills associated with diverse groups of students.

In teacher education, the knowledge generated by research with diverse students can then contribute in the multicultural strand employed by teacher educators in teacher preparation programs. Multicultural theorists such as Boyer (1991), have outlined teacher education plans for preparing effective teachers to teach culturally diverse students. Components of such multicultural plans typically include experiences with students of many cultures and ethnic groups, studies in students' learning styles and ethnic histories, an emphasis on sociological concepts concerning intergroup relations, and an overview of the contributions of ethnic groups in individual fields of study. An area the recommended research on a multicultural pedagogical content knowledge can contribute in these multicultural plans is more focus in the subject specific pedagogy.

The multicultural pedagogical content knowledge base constructed can be shared in teacher preparation programs, in teacher inservice workshops, and in curricular materials. An

example of multicultural pedagogical content knowledge identified in this study relevant for African American students in earth science is Polaris as the beacon to the North for slaves in the South.

The third level of implications focuses on the social contexts in which the students and teachers operate. Investigating the social contexts in which the teachers in this study operated provided the insight that the teachers' beliefs were congruent with one interpretation of the communication code expressed in their school. Researchers such as Banks (1988) and Oliver (1991) propose models that identify the necessary components of multicultural education in the immediate school social level (e.g. mission, staffing, curriculum and instruction, school policies, assessment and testing procedures, teaching styles and strategies, and the beliefs, attitudes, perceptions of the staff). Common to those models are the need to include the total school environment, including administrative commitment and community support, in the goal of implementing a multicultural program. Findings in this study suggest that a commitment to multicultural education will be expressed in a communication code expressed in a school. Through the process of semiosis, the generation of signs, communication supportive of multicultural education practices can be developed by education reformers and applied on an experimental basis in school settings.

A final implication of this study is the need to further investigate teacher actions during teaching in which the teachers

express no alternatives strategies. The suggested association of those kind of actions during-teaching with the mores of science teaching is a new research focus with potential insights toward the better understanding of science teacher practices.

Findings in this study contribute toward a grounded theory of multicultural teaching practices by focussing on the decision-making of teachers. The deconstruction of the participant teachers' decision-making before-teaching, during-teaching, and after-teaching indicated that teaching a culturally diverse student population does not necessarily prompt teachers to include a consideration of the cultural diversity of their students. In addition, holding an interpretation of a constructivist epistemology does not necessarily prompt a consideration of the cultural diversity in teacher decision-making. Two teacher beliefs held by participants in this study, all students should be treated the same and students' cultural and ethnic diversity should not be acknowledged in the teaching/learning of academic subjects, acted as barriers to the consideration of multicultural considerations.

A theory developed in sociology and anthropology offers insight toward developing grounded theory in this study. "Rules of conduct" Collete (1977), describes how rules that govern individuals' behavior are created and enforced in cultures. Individual actions are shaped, guided, and constrained by culturally agreed upon rules that guide individuals' conduct. Rules are agreed upon norms of conduct passed down generation to

generation in a community. An individual's actions are evaluated by other members of the culture through consideration of if the person knows or does not know the rules and through consideration of if the person's behavior does or does not accords with the rule. The identification of rules is performed through interpretation of actions of many members of a community. An example of a special rule of conduct in most cultures is the incest taboo (Fortes, 1983).

A hypothesized rule of conduct that filtered the conduct of the two participant science teachers' decision-making before-, during-, and after-teaching was "Fair play." Treating students fairly was perceived by the teachers as requiring them not to discriminate against individual students due to their ethnic or cultural backgrounds. As a result, the acknowledgement of the students' differences was restricted to their academic ability (as indicated on formal assessment tasks) and their motivation demonstrated in class. Students' cultural and ethnic differences were considered potential areas of discrimination and were not included in pedagogical decision-making. Figure 3 presents a provisional schema of the participant teachers' decision-making filtered by the rule of conduct fair play.

Secada (in press) offers an encouraging insight into teacher decision-making that relates to this hypothesis. Secada states that most teachers hold a belief in social justice founded on equality, instead of equity, which causes them to treat all students the same. He believes that teacher decision-making will

not change unless teachers' perspective of social justice is founded on equity, instead of equality, which will cause them to consider treating students differently to more appropriately meet the needs of different students.

INTERPRETATION OF DECISION MAKING WITH MULTICULTURAL EDUCATION AS RELEVANT
TEACHER ACTIONS
RITUAL INSTRUCTOR-ACTION PRACTICES
DECISION-MAKING INSTRUCTOR-PRACTICES
One-responsive actions that provided insight into the mores of teaching held by the teachers.
For example:
Mrs Guide: Assist students in learning science vocabulary
Mr Green: Minimize teacher exposition and maximize student activity
BEFORE-TEACHING classroom environment science unit planning individual lesson planning
DURING-TEACHING (idiosyncratic binary categories)
For example:
Mrs Guide: Provide the answer or make the students find the answer
Mr Green: Ride that wave or nip it in the bud
AFTER-TEACHING evaluation of lesson
MULTICULTURAL EDUCATION FACTORS RECOMMENDED BY THEORISTS
COGNITIVE AND AFFECTIVE FACTORS
e.g. Western and Non Western Ways of Knowing; Styles of Learning; Gender Related Attitudes Toward Science; Locus of Control and Motivation; Career Expectations
CLASSROOM ENVIRONMENT FACTORS
e.g. Student Interactions; Social and Emotional Climates; Group vs. Individual Achievement
ASSESSMENT AND EVALUATION FACTORS
e.g. Standardized or Individualized; Ability Grouping or Mixed classes
TEACHER KNOWLEDGE FACTORS
e.g. Cultural groups history, culture, and contributions
TEACHER BELIEFS AND VALUES FACTORS
e.g. Expectations of students, empowering students
COMMUNICATION PATTERN FACTORS
e.g. Standard English or non-standard English, body language, auditory or visual
TEACHING METHOD FACTORS
e.g. Use of mixed cooperative learning groups, learning by doing; non-competitive activities
CURRICULUM FACTORS
e.g. community based curriculum, detection of biases
RULE OF CONDUCT FILTER: FAIR PLAY
Fair play Defined By Teachers: social justice founded on equality.
Teachers Beliefs That Supported the Rule of Conduct:
Mrs Guide: They are all kids (in school)
Mr Green: They are all kids (but the Black students do distinguish themselves)
School Communication Code That Signified The Rule of Conduct: ;
Code of Contradiction. Students' diversity extolled in social sphere; students' diversity not acknowledged in teaching/learning sphere
MULTICULTURAL EDUCATION FACTORS INCLUDED IN DECISION-MAKING BY PARTICIPANT TEACHERS:
BEFORE-TEACHING
Mrs Guide:
Classroom Environment Factors
Distribute mainstream and non-mainstream students throughout seating chart (supported)
Communication Pattern Factors
Emphasize language assistance for Limited English Proficient students (supported)
Mr Green:
Classroom Environment Factors
Assign Limited English Proficient students seats together (not supported)
DURING-TEACHING
Mrs Guide:
Communication Pattern Factors
Give Limited English Proficient students multiple opportunities to answer oral questions (supported)
Pick school/class as reference point for examples (supported)
Teaching Method Factors
Establish nonheterogeneous cooperative learning groups (supported)
Mr Green:
Teacher Knowledge Factors
Use student suggested science example that focused on one ethnic group (supported)
Communication Pattern Factors
Allow Limited English Proficient students to work together in cooperative learning group (not supported)
AFTER-TEACHING
Mrs Guide: None
Mr Green: None

Figure 1: Provisional schema of participant teachers' decision-making

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Actions taken to address teachers' rules of conduct directly impacting on their teaching of diverse students will necessarily have to be systemic across the areas investigated in this study. The social contexts in which teachers work need to encourage multicultural teaching practices. The promotion of a multiethnic society valuing cultural pluralism instead of the promotion of an assimilationist or melting pot society must exist. The perspective of the learner, encouraged by the constructivist epistemology, must place emphasis on an understanding of how the learners' cultural and ethnic background influences the learning field in addition to an appreciation of the learner's prior subject knowledge. And, the perspective of how to teach the subject matter should be based on a pedagogical content knowledge identified in teachers' teaching practices that include multicultural considerations.

Conclusions

An analysis of the social contextual data indicated that cultural diversity was a relatively new phenomenon for the social systems to accommodate in this state. Traditionally, divisions between Whites and African Americans created a bicultural climate in which racism existed.

Data from the teachers were first analyzed through the application of analytic induction and the constant comparison method (Erickson, 1986; Glaser and Strauss, 1967). Sample teacher beliefs concerning teaching culturally diverse students included: <u>They Are All Kids to Me</u>, and <u>Their Differences Are An Obstacle</u> (for the life science teacher) and <u>They Are All Kids To Me (But The</u>

Black Kids Do Distinguish Themselves) and Adults Can Learn From Them (for the earth science teacher). Sample student beliefs were Let Us Work Together and Everyone Is Human.

The majority of teacher actions were characterized by the teachers as not containing pedagogical alternatives. Those actions which were one-responsive were termed **ritual-instructor action-practices** and provided insight into the cultural teaching mores held by the teachers. The remainder teacher actions which were identified by the teachers as containing pedagogical alternatives were termed **decision-making instructor-practices**.

The analytic categories that emerged for before- and after-teaching decision-making for both teachers were the same. Sample decision-making categories before-teaching included the classroom environment, science unit planning, and a focus on the individual science lessons. After-teaching decision-making involved only an evaluation of the lesson. Neither teacher stated that they considered the diversity of the students in those categories. During-teaching decision-making categories varied per teacher but were binary for both teacher. Sample choices included Ride That Wave or Nip It in the Bud (for the earth science teacher) and Provide the Answer or Make Students Find the Answer (for the life science teacher). The only consistent factor relating to the international non-mainstream students that entered the teachers' decision-making was concern for the Limited English Proficient (LEP) students. Both teachers held a rule of conduct defined as fair play that was based on equality. This rule was hypothesized

to acted as filter which discouraged consideration of other potential multicultural factors identified by theorists.

Semiology, the science of signs, was employed by the researcher to gain insight concerning the communication at the research site. Antithetical slogans such as "Our differences make us unique!" (indicative of cultural pluralism) and "Diversified cultures for a unified purpose" (indicative of the melting pot) represented two categories of signs in the school. The communication code was described as a Code of Contradiction and was perceived as signifying a rule of conduct that resulted from a belief of fair play based on equality and not equity (Secada, 1989). Thus, the students' ethnic differences was valued in the social sphere, but the learning/teaching sphere was reserved for a uniform culture.

Significance

The major finding gained from this study was that a rule of conduct, fair play, acted as an effective filter that excluded consideration of most multicultural factors in the participant science teachers' decision-making process. Through an application of semiology, the science of signs, this insight was obtained. A communication code of the participants' school was identified and described as a Code of Contradiction. This code signified the exclusion of the students' cultural and ethnic backgrounds in science content and pedagogical decision-making. The result was that the teachers compartmentalized their acknowledgement of the students' ethnic diversity in the social sphere while excluding it

from the teaching and learning sphere.

Qualitative investigations of this sort that focus on local cultures and employ the new mix of research domains described in this study (ethnicity, teacher decision-making, constructivism, and semiology) offers a promising new direction for research in multicultural education.

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